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PREVENTING DAMAGE TO COMMERCIAL DRIED FRUITS BY THE RAISIN MOTH

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In the United States the raisin moth (*Ephestia figulilella* Greg.) occurs in California and Arizona. It is especially abundant in the fruit-growing areas of the San Joaquin and Sacramento Valleys, where mild winters and a plentiful supply of waste fruits permit survival in vineyards and orchards throughout the year.

Fruits Damaged

Infestation in commercial dried fruits is most extensive in raisins, peaches, apricots, pears, and figs. Damage consists of feeding, largely on the surface, and deposition of fecal pellets and silken webbing.

Under some conditions growing grapes become infested by the raisin moth. Larvae may attack sound grapes, as illustrated in figure 1, but as a rule the presence of these insects in grapes on the vines results from previous injury from other causes, chiefly the exposure of pulp by the cracking and crushing of berries in tight bunches, which leads to a severe type of spoilage known as bunch rot.

Life History of Moth

The drab-gray moths are about three-eighths of an inch long when at rest with wings folded. They are active chiefly in the early evening, spending the daylight hours in shaded, protected places. Their length of life is about 2 weeks, during which time the females produce about 350 eggs each. The minute white eggs are scattered about on the fruit. When full-grown, the larvae (fig. 1) are one-half inch long, white, with four rows of purple spots along the back. In warm weather the eggs hatch in about 4 days; the larvae feed and grow for about 1 month, then leave their food and enter the soil or some other dark retreat to transform and emerge as adults.

The well-grown larvae overwinter in the topsoil or under the loose bark of grapevines. Waste fruits, of which mulberries are the earliest to ripen, are abundantly available as larval food, and breeding continues from April or May until November.

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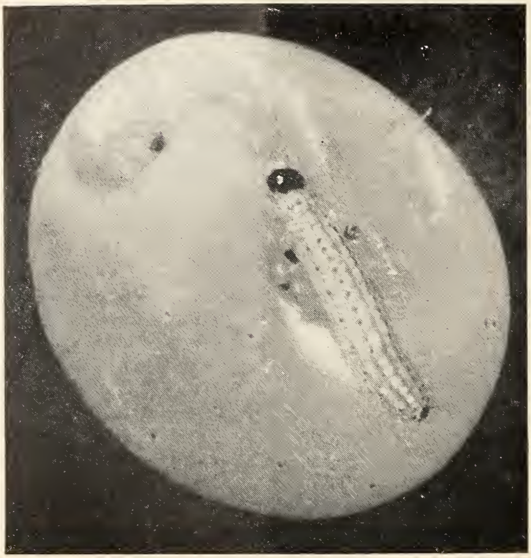

FIGURE 1.—Nearly mature larva of the raisin moth feeding on a grape. About 3 times natural size.

Control in Raisins

Handling of Raisins on Drying Trays

Reduction of infestation in the earlier varieties of raisins, such as Zante (Corinthe Noire) and Thompson Seedless (Sultanina), can be accomplished by using paper trays rolled in the "biscuit" roll, as shown in the illustration on the cover. Carelessly made rolls or rolls containing too much fruit do not provide good protection. Raisin moth eggs are laid on the fruit at night, and since hot sun kills many of them, trays should be rolled in the afternoon, if possible, to avoid enclosing living infestation in the packages. Raisins in rolled trays should be boxed in the vineyard or immediately after the rolls are brought to the farmyard. Handling the rolls loosens them, and when such rolls are stored in the farmyard, infestation increases.

Late-maturing Muscat raisins dried on wooden trays, which can be stacked when rain threatens, are more exposed to attack by the raisin moth than are raisins dried on papers. Growers who wish to protect raisins that have been stacked after completion of drying on spread trays can do so by using covers of shade cloth, as shown in figure 2.

Removal of Infestation by Screening

Raisin cleaners driven by electric motor have been found effective for removing infestation from Zante and Thompson Seedless raisins. About 90 percent of the eggs and larvae can be screened out if the

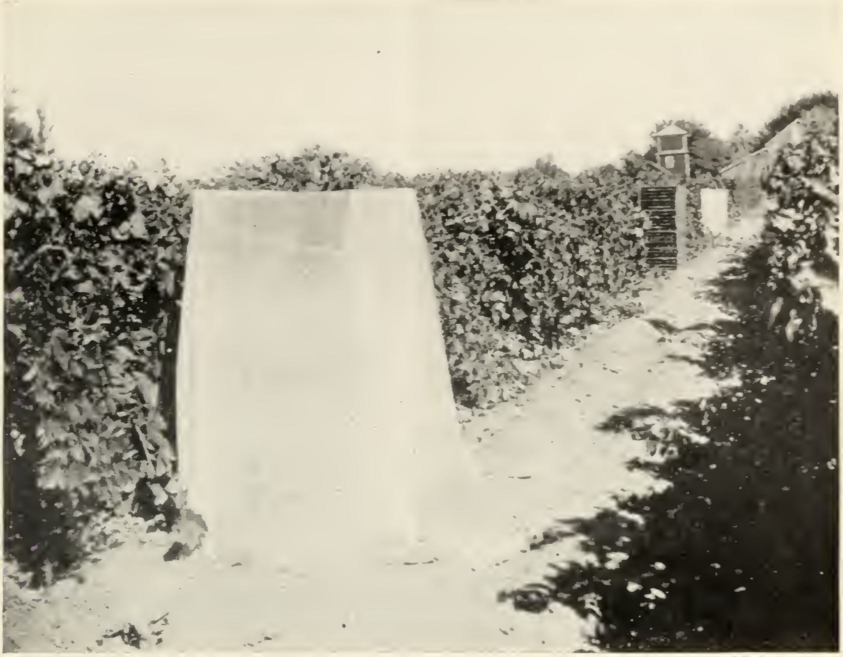

FIGURE 2.—Shade cloth in use for excluding raisin moths from raisins drying on stacked wooden trays. The cloth is an open-weave material similar to cheesecloth and is used for covering fields of wrapper tobacco, asters, and chrysanthemums.

screen is properly operated. The screen should not be overloaded with raisins; passing too thick a layer of fruit over the screen reduces the efficiency of the operation. Rubbing the clusters against the screen by hand to break them up should be avoided, since rough handling may bruise the fruit and remove cap stems, impairing the keeping quality of the raisins. The method of handling found most economical of labor is to run the raisins over the cleaner into sweatboxes from paper trays without intervening storage or extra handling.

The machine does not do so thorough a job with Muscat raisins because the berries of this variety do not readily shatter, and many of the clusters retain their compact form. Figure 3 shows a cleaner that has been in successful use for several years. An important advantage of the machine is that it removes dust and sand before the raisins are stored.

Protection of Boxed Raisins

Although the length of time that boxed raisins are stored on the ranch is influenced by market conditions, prompt delivery to buyers is desirable because infestation increases during periods of favorable temperature. Covering the boxes with shade cloth keeps out much

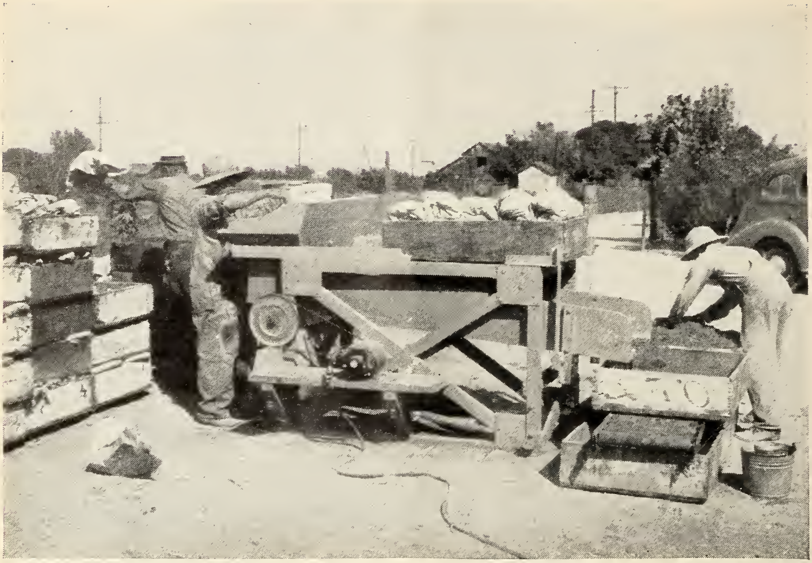

Figure 3.—Portable shaker screen or raisin cleaner. The sweatbox full of biscuit-rolled paper trays is used as a weight to reduce vibration. A roller conveyor at the outlet improves the efficiency of handling.

of the raisin moth infestation that would otherwise occur during storage on the ranch.

Reduction of Sources of Moths

In some parts of the range of the raisin moth the mulberry trees produce much waste fruit and, consequently, great numbers of raisin moths. A nonfruiting strain of mulberry could be substituted for shade. In addition, whatever can be done to eliminate supplies of other waste fruits will reduce the raisin moth population. These suggestions apply also to efforts to control infestation in drying cut fruit and figs. During the hot summers in regions where sun-dried fruits are produced, raking fallen mulberries or other waste fruits into the sun will result in control of infestation if the fruit is spread thinly. Piles of peach pits, which also produce moths, should be spread out in the sun.

Control in Drying Cut Fruits

Raisin moth infestation in drying apricots, peaches, nectarines, and pears occurs to a slight extent while the fruit is drying in the hot sun on spread wooden trays. It is during the completion of drying on stacked trays, however, and while the fruit is temporarily stored in boxes at the ranch drying yard that the infestation often becomes extensive. Satisfactory control can be attained by covering the stacked trays and boxes with shade cloth. Because the heat of the sun kills eggs deposited the previous night, spread trays should be stacked late in the afternoon. Pieces of cloth large enough to allow plenty of slack on the ground should be used, and the slack should be held down by boards. Trays should be arranged over the stacks or boxes so as to support the cloth away from the fruit. The use of shade cloth for the protection of drying peaches is shown in figure 4.

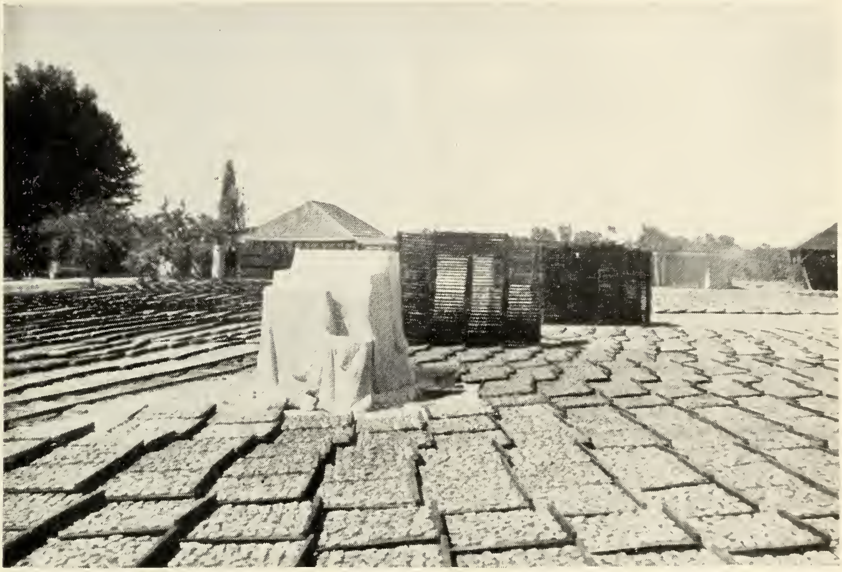

FIGURE 4.—Shade-cloth cover protecting stacked trays of drying peaches from infestation by the raisin moth.

An alternative program of control in dried cut fruits is as follows: Fumigate the fruit as soon as it is boxed from stacked trays and cover the boxes with shade cloth. This method calls for a smaller quantity of shade cloth than is used for covering trays. Special equipment is required for fumigation. Chloropicrin or methyl bromide, used at the rate of 1 pound per 1,000 cubic feet of space, will give good results in a tight chamber.

Fumigants are poisonous, and operators should wear gas masks for safety. Fumigation should be done by specially trained crews properly equipped for the work.

Control in Figs

Raisin moth infestation in figs on the trees occurs only rarely, but after the fruit falls to the ground it is likely to become heavily infested. The longer the intervals between pickings, the heavier the infestation becomes. It follows that prompt gathering reduces infestation.

Fumigating the partly dried figs before they are spread on trays in the sun destroys infestation. The dosages and fumigants suggested above for the fumigation of dried cut fruits are also recommended for figs. Some handlers have favored mixtures of three parts of ethylene dichloride and one part of carbon tetrachloride, used at the rate of 15 or 20 pounds per 1,000 cubic feet. Figs on stacked trays or in boxes may be protected by sheets of shade cloth.

Plowing under waste figs of the early first crop provides conditions which breed an abundance of raisin moths. Instead of being plowed under, such figs either should be raked out of shaded locations to permit destruction of raisin moth infestation by the heat from the sun or picked up and used at once for stock feed.

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